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Brexit Uncertainty Is Taking a Toll on the British Economy

While the outcome of Brexit negotiations is still unclear, the three-year lead-up to the scheduled withdrawal of Britain from the European Union has already damaged the United Kingdom's economy through increased uncertainty. This has reduced investment by British firms by about 11 percent, and lowered productivity by between 2 to 5 percent, according to [Nicholas Bloom](#), [Philip Bunn](#), [Scarlet Chen](#), [Paul Mizen](#), [Pawel Smietanka](#), and [Gregory Thwaites](#) in their new study, [The Impact of Brexit on UK Firms](#) (NBER Working Paper 26218).

"The vast majority of 'uncertainty shocks' throughout history — the 1973 OPEC oil price shock, Gulf Wars I or II, the 9/11 attacks, the collapse of Lehman Brothers, etc. — generate a

surge in uncertainty that subsides reasonably quickly as markets participants' initial fears are allayed by fur-

Uncertainty is associated with reduced investment and lower productivity, with particularly large effects at highly productive firms most exposed to EU trade.

ther information becoming available," the researchers write. "Brexit is unusual

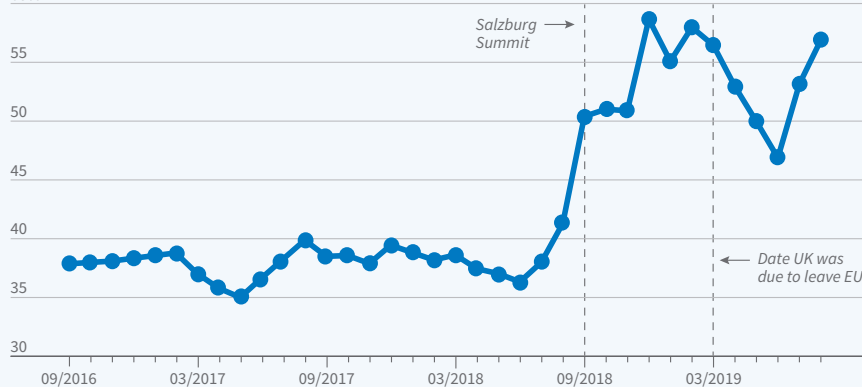
in that it generated persistent uncertainty — three years after the original vote, the UK had not left the EU, there

was still no clarity on the eventual outcome, and our survey results show that there was substantial unresolved uncertainty."

Using several years of data from the Decision Maker Panel (DMP), a survey which includes 5,900 United Kingdom firms employing about 14 percent of the nation's private-sector workers, the researchers find that almost 40 percent of firms consistently rank Brexit as one

Firm-Level Brexit Uncertainty Index

Share of UK firms reporting that Brexit was among their top three drivers of uncertainty



The Decision Maker Panel represents 42,000 active UK businesses with 10 or more employees
Source: Researchers' calculations using data from the Decision Maker Panel survey

of the three most important sources of uncertainty. This percentage has increased over time. By comparison, other measures of uncertainty, such as stock market volatility, rose after the 2016 Brexit referendum but receded a few weeks later.

After the Brexit vote in 2016, British firms' investment initially didn't plunge as much as some had predicted. Instead, it fell gradually: significantly in the first year, especially for those companies most exposed to trade with the EU, less the second year, and then more the third year as the date of the separation approached.

"The huge uncertainty surrounding the process and its persistent nature may have led firms to act cautiously and not

cut investment as quickly as might have been expected," the researchers write. They note that some previous research suggests that high and persistent uncertainty can actually slow firms' response to a shock.

Productivity growth also has slowed, and firms with the greatest Brexit-related uncertainty have experienced the biggest drops. With uncertainty reported on a scale from 1 to 4, with 4 being the highest level of uncertainty, firms that reported an uncertainty level of 4 saw productivity fall 1 percentage point more than those that reported a 3, which in turn saw an effect one percent larger than firms that reported a 2. Firms with the most exposure to the EU trade saw

the biggest drops; these also tend to be the most productive companies.

One reason for the productivity slowdown may be that top management was spending time on Brexit preparations. In the period from November 2018 to January 2019, the DMP survey found that 10 percent of chief financial officers and 6 percent of chief executive officers were spending at least 6 hours a week on how to cope with Brexit; more than 70 percent said they spent some time every week on it. Other factors, such as slowing investment in R&D, software, and training, and fewer skilled foreign employees, may also contribute to the productivity slowdown.

— *Laurent Belsie*

Evaluating Unconventional Monetary Policies after the Great Recession

After the Federal Reserve effectively slashed interest rates to zero in response to the Great Recession, some doubted that there was much else it could do to accelerate the pace of recovery. The Fed pursued a range of unconventional monetary policy tools when faced with the "zero lower bound" (ZLB) on nominal short-term interest rates. These policies, which were designed to influence long-term rates by changing expectations of future short-term rates, included forward guidance, which Fed officials offer through announcements and summary projections, as well as transactions in the markets for long-term assets. A new study suggests that these novel actions played an important role in the post-recession recovery.

In **The Federal Reserve's Current**

Framework for Monetary Policy: A Review and Assessment (NBER Working Paper 26002), [Janice C. Eberly](#), [James H.](#)

[Stock](#), and [Jonathan H. Wright](#) calculate that, absent unconventional monetary policies, the unemployment rate would

Without deployment of forward guidance and asset purchases by the Federal Reserve, recovery from the Great Recession would have been slower.

later than it actually did. (The natural rate of unemployment is the rate that is associated with job changing and labor turnover in an economy operating at full employment.) The researchers find that an expansion of unconventional policies to aggressively lower long-term interest rates early in a crisis would reduce the peak unemployment rate and also hasten the recovery, as shown in the figure. They also find that the rate of inflation would have been approximately 0.2 percentage

Tracking the Effect of More Expansionary Policy on Unemployment

The chart displays the U.S. unemployment rate from 2006 to 2019. The y-axis represents the unemployment rate percentage, ranging from 2% to 10%. The x-axis shows years from 2006 to 2019. Two lines are plotted: a black line for 'Actual policy' and a blue line for a counterfactual scenario. Both lines show a sharp increase starting in late 2007, peaking in late 2009. The 'Actual policy' line peaks at approximately 10%, while the counterfactual line peaks at approximately 9%. Following the peak, both lines show a steady decline, with the counterfactual line consistently below the actual line, indicating a lower unemployment rate and a faster recovery. A text box in the chart states: 'If the Federal Reserve policy had flattened the yield curve by an additional 1 percentage point for 5 years, starting in Dec. 2008'. Source: Researchers' calculations using data from the Congressional Budget Office, the Bureau of Economic Analysis, the Federal Reserve System, and the U.S. Department of the Treasury.

points lower than it was during the latter part of the recovery if the Fed had not adopted unconventional policy steps.

The researchers also estimate the effect of changes in the federal funds rate, the traditional monetary policy tool, on economic outcomes. They find that when such policy actions are not constrained by the ZLB, they have substantial effects. For example, Fed policies

would have been much more effective if interest rates and inflation had been higher before the recession, leaving more headroom to lower rates during the crisis. Had the economy entered the recession with the short-term interest rate and inflation 1 percentage point higher than they actually were, the economy would have recovered faster and the unemployment rate would have dropped to the natural rate seven quarters earlier than it

actually did.

On the other hand, deploying these policies later, during the recovery, has less impact. If the Fed had delayed its increase in interest rates during the recovery by one year, waiting until late 2016 instead of late 2015, the estimates suggest that the effect on the unemployment and inflation rates in late 2016 would have been negligible.

— Laurent Belsie

How Timing of Parenting Tips Boosts Their Effectiveness for Children

“Point out the first letter in your child’s name in magazines, on signs and at the store. Have your child try. Make it a game. Who can find the most?”

That tip is an example of parenting advice offered by an educational program that sends text messages to parents of preschoolers. The program has proven effective at boosting children’s literacy and math skills.

But when should the messages be sent? On weekends, when parents typically have more time to spend with their children? Or on weekdays, when working parents may be more receptive to outside help to make the most of their limited time with their children? Does it matter?

In **When Behavioral Barriers Are Too High or Low — How Timing Matters for Parenting Interventions** (NBER Working Paper 25964), [Kalena E. Cortes](#), [Hans D.U. Fricke](#), [Susanna Loeb](#), [David S. Song](#), and [Benjamin N. York](#) studied this issue. They recruited a sample of pre-kindergarten students from the Dallas Independent School District, the 14th largest public school district in the nation. They found that on average, sending the text messages over the weekend had a larger impact on student performance, but that the results varied depending on the baseline skills of the students.

Participating families were nearly all

economically disadvantaged; more than two-thirds were Hispanic. Parents had their choice of receiving texts in English

“FACT” — information on child literacy development and best parenting practices, “TIP” — specific exam-

The challenges of the workweek make it difficult for parents to make effective use of tips sent by text on weekdays.

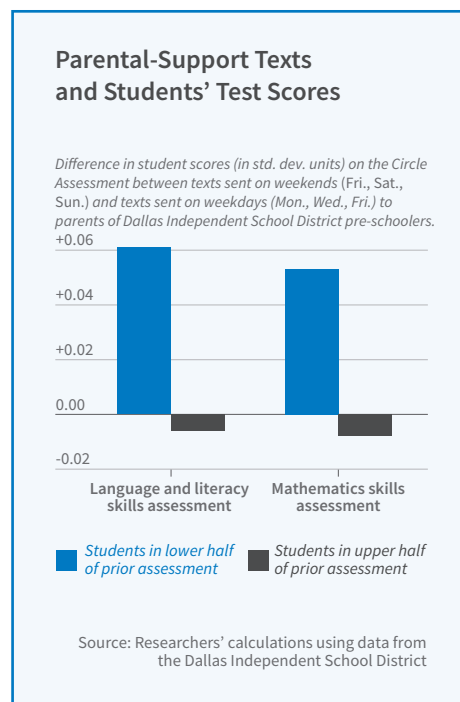
or Spanish. Only 28 percent of the parents had completed at least some college.

The text-messaging program was developed at Stanford University. Offered over an eight-month period coinciding with the school year, it sends three types of messages:

ples of parent-child activities, and “GROWTH” — aimed at reinforcing earlier messages and offering encouragement. Most of the activities can be worked into family routines readily, turning daily activities such as commuting and meals into learning opportunities.

Parents were randomly divided into three groups that differed only in the timing of messages. The weekday group received FACT texts on Monday, TIP texts on Wednesday and GROWTH texts on Friday; the weekend group received messages in the same order, but on Friday, Saturday, and Sunday. To tease out the impact of sending texts on consecutive days, the third group, midweek parents, received messages on Tuesday, Wednesday, and Thursday.

Student competency was measured using the Circle Assessment System at the start, middle, and end of the school year. Language and literacy skills were based on timed assessments, such as rapid vocabulary, a one-minute task gauging a child’s ability to name common objects, and phonological aware-



ness, a five-minute drill of a child's understanding of sounds like alliteration and rhyming. Math skills were assessed through such exercises as counting and identifying numbers and shapes.

Overall, the researchers found that the challenges of the workweek were too great for parents to make effective use of the text-messaging program. This was especially the case for parents of children who scored in the lower half of the Circle

assessment at the outset of the study. The researchers conclude that it is important to factor in parents' outside demands and their children's skill levels when attempting to optimize learning programs.

— Steve Maas

Lasting Impacts of a Gas Price Shock during Teenage Driving Years

Individuals who were in their mid-30s at the time of the 2000 US decennial census are less likely to drive to work and more likely to commute by mass transit than their peers in younger and older age groups.

One explanation is that this cohort came of driving age between 1980 and 1981, as the nation was reeling from the oil shock triggered by the success of Iran's Islamic revolution in 1979. As these 15- to 17-year-olds were getting their driver's licenses, they saw gasoline prices double in a year and experienced long lines at the pumps.

In **Formative Experiences and the Price of Gasoline** (NBER Working Paper 26091), Christopher Severen and Arthur van Benthem show that these drivers were 0.3 to 0.5 percentage points less likely to drive to work later in life and 0.2 to 0.3 percentage points more likely to take mass transit in 2000 than those who started driving in less volatile times. The disparity was by far the most pronounced among those in the affected cohort living in urban areas with transit alternatives. In cities, people aged 36 and younger were 0.6 to 1.9 percentage points less likely than those 37 or older to drive to work.

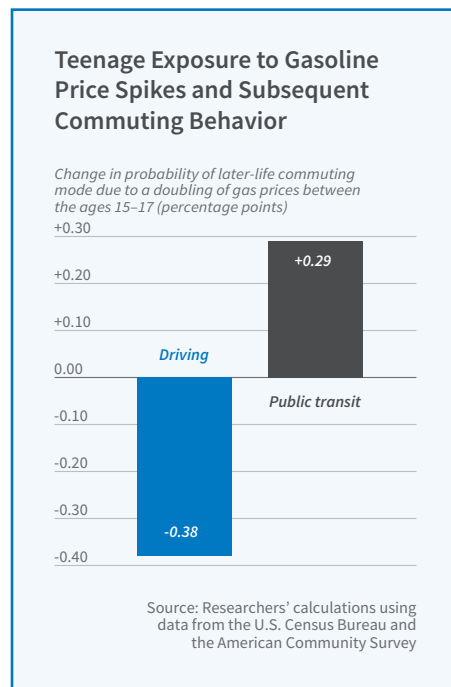
These findings suggest that a consumer's initial encounter with a product — even a mundane product like gasoline — can have a long-lasting impact on behavior. Such initial encounters help explain what later appears to be heterogeneity in preferences.

Since the 1970s, gasoline prices have trended higher, with intermit-

tent dips. The researchers combine data covering nearly 40 years of driving behavior with state gasoline prices to establish that this effect is not specific

Americans who came of driving age during the rapid gas price increases and long waiting lines of 1980–81 were driving less than older and younger peers two decades later.

to the 1979 oil crisis. They find that individuals respond to price changes during their formative driving years much more than to price levels.



Not only do adults whose formative driving years see a doubling in gas prices reduce driving to work by 0.3 to 0.4 percentage points later in life, they also drive 3.4 to 8.2 percent fewer miles (conditional on having access to

a vehicle). This amounts to an average annual reduction of 900 to 1,100 miles. They are also somewhat less likely to own fuel-inefficient light-

duty trucks than other age groups.

The researchers draw on decennial census data, which include questions about commuting mode and time, as well as the more frequent American Community Survey and the National Household Travel Survey. Their most recent data are from 2017.

The effects are concentrated on those who experience a jolt in gas prices between the ages of 15 and 18, without an effect on those younger or older. “The lack of an effect of gasoline price shocks after this formative window suggests initial contact may be more important than the cumulative experience for some behaviors,” the researchers write. These effects persist throughout prime age working years, and are strongest between the ages of 25 to 34 and 44 to 54.

The difference in driving patterns between drivers who experienced these gas price shocks and those who did not cannot be explained by such factors as income, educational levels, or marital status, the researchers report. Nor can it be attributed to putting off getting driver's licenses or not obtaining them at all. This suggests formative experiences imprint later behavior.

— Steve Maas

Minority Borrowers Pay More, Even under Algorithmic Lending

In 2017, \$2.25 trillion of the \$13 trillion of outstanding household debt in the United States was associated with minority households. The bulk of this borrowing, \$1.65 trillion, was mortgages.

Previous research has shown that minority households, on average, pay more to borrow than other households. The extent to which these disparities are due to discrimination by lenders, as opposed to differences in borrower attributes, is an ongoing subject of study. Some have observed that if discrimination is the source of differences in loan terms, then the rise of automation in the lending process as part of the FinTech revolution, and in particular the use of algorithms rather than loan officers to review mortgage applications, could narrow lending disparities.

Algorithmic loan origination has grown substantially in recent years: Quicken's Rocket Mortgage was the largest-volume mortgage product in the US market in 2018. Forty-five percent of the country's largest mortgage lenders now offer online or app-based loan origination.

In **Consumer-Lending Discrimination in the FinTech Era** (NBER Working Paper 25943), Robert Bartlett, Adair Morse, Richard Stanton, and Nancy Wallace estimate the magnitude of lending discrimination in the US mortgage market and assess whether the growth of FinTech has reduced bias in this market.

The researchers create a dataset of mortgages securitized by the government-sponsored enterprises (GSEs) Fannie Mae and Freddie Mac. GSEs assess a guarantee fee on each loan, calculated based on the borrowers' credit score and the loan-to-value ratio; lenders are then guaranteed against credit risks. Because of this guarantee, differences in mort-

gage rates among loans with the same credit scores and loan-to-value ratios are driven exclusively by lender pricing decisions, not by differences in credit risks.

The researchers follow current US legal conventions in defining discrimination as the

Minority borrowers pay, on average, 7.9 basis points more for first-purchase home mortgages. The gap is larger when they use face-to-face lenders rather than algorithm-based lenders.

use of variables or practices in lending decisions that fall disproportionately on minorities and do not arise from the legitimate business necessity of scoring credit risk. In particular, conditioning loan terms on borrower attributes in a way that raises the lender's profits, for example by taking advantage of limited competition in some markets when those attributes do not predict credit risk, represents discrimination.

The researchers find that African-

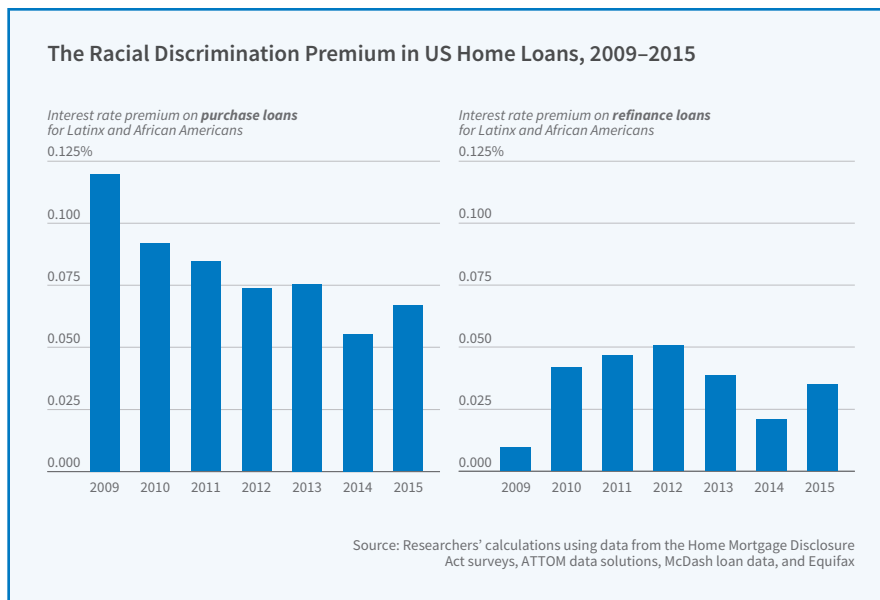
face lenders: Minority borrowers pay 5.3 basis points more for purchase mortgages arranged through FinTech platforms. The researchers observe that their findings are consistent with both FinTech and non-FinTech lenders extracting monopoly rents in

weaker competitive environments or seeking to identify borrowers who are not likely to shop aggressively across alternative lenders, and charging them higher rates.

With respect to loan rejections, the data show that in-person lenders reject minority applicants about 6 percent more often than comparable non-minority applicants, while algorithmic lenders show no difference in loan rejection decisions. The researchers calculate that, from 2009 to 2015, 0.74 to 1.3 million minority applicants were rejected who would have been accepted were it not for discrimination by loan officers. They point out that with "the GSE guarantee, if lenders were to discriminate in the accept/reject decision, it would imply that money is left on the table... (s)uch unprofitable discrimination must reflect a human bias by loan officers."

The researchers find that discrimination in lending declined from 2009 to 2015, a trend they suggest may be due to competition with traditional lenders from automated lending platforms and/or the ease of shopping around made possible by online applications. The results of this study suggest that FinTech may play an important role in reducing bias in the lending market.

—Dwyer Gunn



American and Latinx borrowers who receive loans pay, on average, 7.9 basis points more than comparable borrowers for purchase mortgages and 3.6 basis points more when refinancing existing mortgages. They calculate that this discrimination costs such families about \$765 million a year. FinTech algorithms discriminate about 40 percent less than face-to-

Monetary Policy and Consumer Spending by Different Age Groups

Does monetary policy have the same effect on the consumption spending of households at various points in the lifecycle? Kimberly A. Berg, Chadwick C. Curtis, Steven Lugauer, and Nelson C. Mark explore this question in **Demographics and Monetary Policy Shocks** (NBER Working Paper 25970). They conclude that instruments of monetary policy that affect asset values, such as reductions in interest rates that tend to raise the value of long-term assets such as government bonds, have a greater impact on older households than on those headed by young or middle-aged Americans. On average, older households hold more wealth, and depend less on labor income to support their consumption. This makes their consumption spending increase more than that of younger households when expansionary monetary policy induces an increase in asset values.

To study how monetary policy affects consumer spending at different ages, the researchers draw on data from the Consumer Expenditure Survey. They sort, then aggregate, households into three categories by the age of the head of household: young (25–34 years old), middle-aged (35–64), and old (65+). They also use four different measures of changes in the posture of monetary policy, capturing shifts between expansionary and contractionary regimes.

Their key finding is that older households' consumption spending is more responsive to

monetary policy shocks than the spending of younger groups; high-income older households are particularly responsive.

The researchers suggest that differences

Older households are wealthier than younger ones, and their consumption spending is more sensitive to policy-induced changes in asset values.

in how households at different ages finance their consumption explain the divergence in the responses to monetary policy. To develop this argument, they draw on data from the Survey of Consumer Finances. They point out that older households are more likely

assets, whose values are sensitive to changes in interest rates. Thus an increase in interest rates — a shift toward a more contractionary monetary policy — would reduce wealth by

more for older than for younger households. This wealth effect in turn leads to lower consumer spending.

The researchers also point out that young and middle-aged households are more likely to respond to monetary-policy induced shifts in

their potential consumption by changing their labor supply behavior. Variation in earnings provides a possible margin of adjustment for younger households, but not for older, retired ones, which may also affect the consumption response to monetary policy shocks at different ages.

The researchers conclude that the profound differences among age group responses to monetary policy may have long-term consequences

for macroeconomic policy in the US and other developed nations where the population is aging. Aggregate demographic trends may affect the overall effectiveness of monetary policy.

—Jennifer Roche

Monetary Policy Shocks and Consumption Growth by Age Group

Cumulative consumption growth following an unexpected one standard deviation increase in expansionary monetary policy +1.5%



Unexpected monetary policy is measured using federal funds futures on the day of a Federal Open Market Committee meeting. Source: Researchers' calculations using data from the U.S. Consumer Expenditure Survey and the Chicago Board of Trade

to be retired, and to be financing their consumption from investment income or from the sale of accumulated assets than their younger counterparts. Older households are also much more likely to hold long-term

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